REPORT NO. 77-2-13

SEPTEMBER 1977
5200

USE OF FURADAN® DURING 1977 IN SOUTHERN PINE SEED ORCHARDS

U. S. FOREST SERVICE
PINEVILLE, LOUISIANA

U. S. DEPARTMENT OF AGRICULTURE -- FOREST SERVICE
SOUTHEASTERN AREA, STATE AND PRIVATE FORESTRY
RESOURCE PROTECTION UNIT, FOREST INSECT AND DISEASE MANAGEMENT GROUP

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Compiled by:

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Southeastern Area, State & Private Forestry
Forest Insect and Disease Management
Pineville, LA 71360

INTRODUCTION

This summary of Furadan® use in southern pine seed orchards is a source of information for seed orchard managers. Other information on Furadan has been and will be provided to you in the Pollen Grain.

The following information is provided in this report:

1. Furadan applications by State and Seed Orchard
2. A procedure for calibration of a granular insecticide
3. A method for evaluation of Furadan for insect control
4. Seed orchard addresses
5. Sources for insect control assistance

I encourage you to evaluate the insect control provided from Furadan applications. By all of you doing this, we can develop the best procedures and guidelines for insect pest management programs. It is important that you evaluate Furadan for one complete seed life cycle (i.e., conelet, cone, seed). Preliminary indications are that you will show your largest increase in seed yield after the second application season.

Please contact us if you have any questions, need assistance with data analysis, note any errors, or have additions to the following summaries.

I will update this report if any of you who did not respond now wish to do so.

SUMMARY OF OPERATIONAL FURADAN APPLICATIONS

FURADAN® APPLICATIONS - 1977

State: Alabama

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
MacMillan Bloedel, Inc.	loblolly	3-7-77	6	19	28[1/]	hand sawdust mulch raked in
Scott Paper Co.	slash	4-4, 7-77	8	1.8	19.2[2/]	hand seeder & double disking (before & after)
Weyerhaeuser[3/]	loblolly	3-11-77	6	67	3	John Deere Pow'r Till Seeder
International Paper Co.	slash	3-8-77	2	2.0	1.3	John Deere Pow'r Till Seeder
			4	3.0	1.3	" " "
			8	5.2	1.3	" " "
	loblolly	3-9-77	8	18	0	" " "
	loblolly	3-11-77	2	16	0	" " "
	slash	3-7-77	2	1	1.3	" " "
		2-10-77	4	3.2	1.3	" " "
		2-9-77	8	7	1.3	" " "

1/ Treated with Thimet®
2/ Sprayed with Guthion®
3/ Irrigated orchard

FURADAN APPLICATIONS - 1977

State: Arkansas

Company	Pine species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Weyerhaeuser	loblolly	2-7-77	8	25	7	Campbell-Daniel[1/] Furadan applicator
	loblolly	3-31-77	8	46	15	John Deere Pow'r Till Seeder

1/ Incorporator consisting of a John Deere planting shoe with a role and coulter in front.

FURADAN® APPLICATIONS - 1977

State: Florida

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application method
Gilman Paper	slash	1-6-77	4.9	14.2	25	Pine tree planter with fertilizer cole hopper on planter
Division of Forestry	slash	3-23, 25-77	6.0	38	17	Brown fertilizer spreader; double gang disc
Container Corp of America	slash	3-15, 16-77	8.0	18	12[1/]	John Deere Pow'r Till Seeder
O-I Southern Woodlands	slash	2-77	4.0	10	Yes	Hand applied & raked in
ITT Rayonier	slash	1-77	8.0	51	0	4-ft. gandy spreader & harrow
Buckeye Cellulose Corp.	slash	1-12-77	8.0	30	4	John Deere Pow'r Till Seeder
International Paper Co.	slash	2-2-77	6.6	57.5	5.5	John Deer Pow'r Till Seeder

1/ Treated with Guthion®

FURADAN® APPLICATIONS - 1977

State: Georgia

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Continental Group, Inc.	loblolly	4-12-77	9	5	9	Gandy seeder & harrow
Georgia Kraft	loblolly	3-28-77	6	20	13.5	John Deere Pow'r Till Seeder
Brunswick Pulp Land Co.	slash	2-7-10-77	4-8	40	2.5	John Deere Pow'r Till Seeder
	loblolly	2-14-15-77	4-8	15	5	John Deere Pow'r Till Seeder
ITT Rayonier	slash	1-77	8	11.5	None	Gandy spreader & harrow
Union Camp	slash	2-77	4	58	7 to 10 rows in each of 3 orchards	John Deere Pow'r Till Seeder
Georgia Forestry Commission	loblolly	4-7	5	3	37 1/	Hand applied & harrow
	slash	4-77	5	3	102 1/	

1/ treated with Guthion®

(continued)

FURADAN® APPLICATIONS - 1977

State: Georgia (continued)

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Georgia Forestry Commission	loblolly	4-77	5	3	60 1/	Hand applied & harrow
	slash	4-77	5	3	120 1/	Hand applied & harrow
	loblolly	4-77	5	8	--	Hand applied & harrow
	slash	4-77	5	12	--	Hand applied & harrow
	eastern white	4-13-77	4	3	0	Gandy spreader & disc
	virginia	4-13-77	4	2	0	Gandy spreader & disc
Hiwassee Land Co.	Loblolly	5-5-77	7	5.6	0	John Deere Pow'r Till Seeder
	Loblolly	5-5-77	8	2.3	0	" " "
	Loblolly	5-6-77	8	12.1	0	" " "
	Virginia	5-6-77	8	13.1	0	" " "

1/ Treated with Guthion®

FURADAN® APPLICATIONS - 1977

State: Louisiana

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Continental Forest Industry	loblolly	2-15-77	8	30	5	John Deere Pow'r Till Seeder
Boise Southern	loblolly	2-1-77	4	32	< 1	Hand[1/] disc & burn
	slash			20	< 1	Hand[1/]
International Paper Co.	loblolly	3-1-77	8	67.5	1.5	John Deere Pow'r Till Seeder
			4	1.75	1.5	" " "
			2	2.5	1.5	" " "

1/ Applied to rough around each tree; control burned periphery and disced border to lure birds from orchard.

FURADAN® APPLICATIONS - 1977

State: Mississippi

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Mississippi Forestry Commission	loblolly	3-11-77	8	4.8	Yes	Hand & watering
Erambert	loblolly	2-2-77	4	30.0	4	John Deere Pow'r Till Seeder
International Paper Co.	loblolly	3-29-77 through 4-29-77	8	50.5	No	John Deere Pow'r Till Seeder

FURADAN® APPLICATIONS - 1977

State: North Carolina

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
NC Forest Service	loblolly	2-17-22-77	6	28	none	Homemade 1/
	longleaf	2-23,25, 26-77	6	20	none	Homemade 1/
Weyerhaeuser	loblolly	2-24-77	6	133	20	John Deere Pow'r Till Seeder
Federal Paper Board Co., Inc.	loblolly	2-17-77	6	60	10	Pender Sow Rite Spreader & disc

1/ gandy distributor, steel frame, coulter & cutting blade w/packing roller

FURADAN® APPLICATIONS - 1977

State: Oklahoma

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Oklahoma State Univ. Forest Genetics Research Sta.	loblolly	3-7-10-77	4	14	0	Converted subsoiler w/packing wheel
	shortleaf	3-7-10-77	4	21	6[1/]	Converted subsoiler w/packing wheel
Weyerhaeuser Craig Orchard[2/]	loblolly	2-17-77 3-24-77	6	175	12	John Deere Pow'r Till Seeder

1/ Treated with Cygon®

2/ Irrigated orchard

FURADAN® APPLICATIONS - 1977

State: South Carolina

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
Catawba Timber Company 1/	loblolly	2-8-9-77	8	17	3	Fertilizer spreader & irrigation
International Paper Co.	loblolly	1-19, 20, 21-77	8	30	6.2	John Deere Pow'r Till Seeder
	slash	1-19-77	8	7	27	John Deere Pow'r Till Seeder
Union Camp Corp.	loblolly	2-77	4	32	7-10 rows in each of 3 orchards	John Deere Pow'r Till Seeder

1/ Irrigated orchard (Hertel, et al. 1977. Furadan® (carbofuran) application and avian mortality on Catawba Timber Company's Irrigated Pine Seed Orchard, Catawba, SC. USDA, Forest Serv., S.E. Area, S&PF, FI&DM Rep. No. 77-2-8. 11 p.)

FURADAN® APPLICATIONS - 1977

State: Tennessee

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres		Application Method
				Treated	Untreated	
Hiwassee Land Co	loblolly	5-12-77	5	29.4	none	John Deere Pow'r Till Seeder
Tennessee River Pulp & Paper Co.	loblolly	3/1-8/77	6	35.0	1	John Deere Pow'r Till Seeder

FURADAN® APPLICATIONS - 1977

State: Texas

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres Treated	Acres Untreated	Application Method
International Paper Co.	loblolly	3-22-23-77	2	4.0	2.5	John Deere Pow'r Till Seeder
	loblolly		4	3.5	2.5	John Deere Pow'r Till Seeder
	loblolly		8	16.5	2.5	John Deere Pow'r Till Seeder

FURADAN® APPLICATIONS - 1977

State: Virginia

Company	Pine Species	Date of Application	Dosage (oz per in. dia)	Acres		Application Method
				Treated	Untreated	
Chesapeake Corp.	loblolly	3-4-77	6	45	2	Homemade 1/

1/ Furadan dispensed between two ranks of disc blades.

CALIBRATION PROCEDURE

PREPARING GRANULAR APPLICATOR CALIBRATION PROCEDURES

Developed by the ASAE Agricultural Chemical Application Committee; approved by the Power and Machinery Division Standards Committee; adopted by ASAE December 1974.

SECTION 1–PURPOSE AND SCOPE

1.1 This Engineering Practice is intended as a guide for those who prepare granular applicator calibration procedures. The purpose is to encourage practices that will improve uniformity and accuracy of application with granular applicators. Attainment of accurate and more uniform application can reduce the quantity of active ingredient required for a given degree of control.

1.2 This Engineering Practice pertains to the calibration of row, band, and broadcast applicators. Because of the nature of the variables involved in chemical applications, a single calibration procedure applicable in all situations is not feasible.

SECTION 2–GENERAL

2.1 Safety

2.1.1 An appropriate warning for safe handling of chemicals shall be included with calibration instructions. (See ASAE Standard ASAE S318, Safety for Agricultural Equipment, and sample safety sign in Fig. 1.)

CAUTION

AGRICULTURAL CHEMICALS CAN BE DANGEROUS. IMPROPER SELECTION OR USE CAN SERIOUSLY INJURE PERSONS, ANIMALS, PLANTS, SOIL OR OTHER PROPERTY. BE SAFE: SELECT THE RIGHT CHEMICAL FOR THE JOB. HANDLE IT WITH CARE. FOLLOW THE INSTRUCTIONS ON THE CONTAINER LABEL AND OF THE EQUIPMENT MANUFACTURER.

FIG. 1–SAMPLE SAFETY SIGN

2.2 The amount of granular material applied to a given area depends on the following:

2.2.1 Orifice area. An adjustable orifice is used on most applicators to regulate the flow rate. The orifice area is determined by the orifice setting. Adjustment in the orifice setting should always be made in one direction only, such as from closed to open, to reduce variability in output for a particular setting.

2.2.2 Ground speed of the applicator. A constant speed must be maintained for uniform application. Even on applicators that use a rotor whose speed varies with ground speed, the flow of the granules through the orifice is not necessarily proportional to ground speed.

2.2.3 Product characteristics. The wide variation in size, density, and shape of the particles and the nature of the inert materials require that calibration be made for each chemical applied. (See ASAE Engineering Practice ASAE EP372, Granular Pesticide Guidelines)

2.2.4 Width of treatment. Most calibration procedures are used to determine the amount (kg or lb) applied per unit area of surface (hectare or acre) actually covered with chemical. For band application the area actually treated is the area in the band and not the area of cropland covered. Some row crop recommendations are based on treating in-the-row rather than the area actually covered. In these cases recommendations are generally based on amount of granules per row length; generally kilograms per 100 m of row (ounces per 1000 ft).

NOTE: If a chemical manufacturer lists the application rate for in-the-row application as pounds per 40-in. row acre, it should be converted to ounces per 1000 ft of row by multiplying times 1.22.

2.2.5 Rotor speed. Manufacturer's literature should be consulted for recommended rotor speeds that will give maximum efficiency.

2.2.6 Climatic conditions. Temperature and humidity can change the flow rate of the granules through the orifice.

2.3 The granular application rate may be determined from the following:

2.3.1 Granular application rate =

$$\frac{\text{Quantity used (kg or lb)}}{\text{Area covered (hectares or acres)}}$$

Granular application rate, as calculated, is the amount of granules per unit area. The quantity used is the total quantity of granules (kg or lb) used by the applicator on a measured course. The area covered is the area (hectares or acres) actually treated on the measured course.

2.3.2 In-the-row applications are determined directly by measuring quantity in kilograms per 100 m (ounces per 1000 ft).

2.3.3 There are other good methods for calculating the granule application rate. Tables, charts, and special slide rules are examples. Special factors can be used if the length of the measured course is selected so that a known decimal or fractional part of an acre or hectare is covered with the application width used.

SECTION 3–EQUIPMENT

3.1 The type and amount of equipment needed will depend on the method of calibration. Common items of equipment include:

3.1.1 Tape, 25, 50, or 100 m (50, 100, or 300 ft), or land measuring wheel.

3.1.2 Stakes or flags for marking a measured course.

3.1.3 Containers to collect granules (paper, cloth, or plastic bags).

3.1.4 Scales for weighing granules (kg, lb, ounces).

SECTION 4–CALIBRATION PROCEDURES

4.1 Several different methods are satisfactory for calibration of granular applicators. In each method there are several basic steps that must be performed.

4.1.1 Lay out a measured course in the field where application will take place or in an area having similar soil and terrain conditions. To minimize the error in collecting granules, the acceleration and deceleration distances should be as short as possible and the total distance driven should be as long as is practical. Sufficient quantity of material must be collected during the test to allow for accurate weighing on the scales that are available.

4.1.2 Determine the ground speed that will be used. Except for the orifice setting, ground speed is the most significant factor affecting the application rate. Therefore, it is important that a uniform speed be maintained during calibration and application.

4.1.3 Determine and set the initial orifice setting. Both chemical and equipment manufacturers furnish application rate charts which are intended to be a starting point for determining the correct orifice setting.

INSECT CONTROL

EVALUATION

EVALUATION OF THE 1977 OPERATIONAL FURADAN APPLICATIONS FOR INSECT CONTROL

The following is a suggested format to determine if Furadan provided protection of your cone and seed crop. It is important that you make this evaluation each time you change your method of insecticide application, the rate (i.e., 4, 6, or 8 oz/in tree diameter), or the time of year you apply Furadan.

1. Prior to cone harvest you should;
   a. Select 6 clones common to your treated and untreated area. Each clone should be represented by 2 ramets in each area.
   b. If you do not have an untreated area, or do not have common clones, select 12 clones (1 ramet/clone).
2. The clones should be selected randomly, unless information on productivity or susceptibility are available.
   a. Production --large conelet and cone crops
   b. Susceptibility to insects -- many cones destroyed by coneworm or many of the seeds destroyed by seedbug.
3. At cone harvest, collect all the cones from each ramet and catagorize as:
   a. Sound
   b. damaged --unknown insect, distorted, partially dead
   c. coneworm --pitch mass or exit hole

4. Collect cones for shipment to the Eastern Tree Seed Laboratory (or to do yourself if some of your personnel had CAS training).

   a. CAS (Cone Analysis Survey) - see attached sheet-- collect 5 sound cones from each ramet, bag individually, label bag.

   b. SOSET (Seed Orchard Seed Evaluation Testing) -- see attached sheet-- collect 6 - 10 sound cones from each ramet, bag together, label bag.

SEED ANALYSIS

ORCHARD _____ Date of Cone Collection _____

Species _____

UNTREATED						TREATED					
		Number of Seed						Number of Seed			
Clone	Ramet	Aborted 1st	Aborted 2nd	Insect dam. seed	Empty Sound	Clone	Ramet	Aborted 1st	Aborted 2nd	insect dam. seed	Empty Sound
1.	1.										
	2.										
2	1.										
	2.										
3	1										
	2.										
4	1.										
	2.										
5	1.										
	2.										
6	1.										
	2.										

CONE ANALYSIS

ORCHARD _____ Date of Cone Collection _____

Species _____

UNTREATED (if appropriate)					TREATED				
		NUMBERS OF CONES					NUMBERS OF CONES		
Clone	Ramet	Sound	Damaged	Coneworm	Clone	Ramet	Sound	Damaged	Coneworm
1.	1.								
	2.								
2.	1.								
	2.								
3.	1.								
	2.								
4.	1.								
	2.								
5.	1.								
	2.								
6.	1.								
	2.								

USE OF SOSET AND CAS

Monitoring techniques provide useful information to the seed orchard manager, which help him to efficiently allocate his time and resources. Seed Orchard Seed Evaluation Testing (SOSET) and Cone Analysis Service (CAS) are two services designed to assist the orchard manager in his monitoring task.

SOSET is a relatively low cost method of measuring differences among clones, treatments or intervals of time. It provides a measure of seed production, viability of the extracted seed and a radiographic analysis of the extracted seed. The radiographic analysis identifies insect problems, abnormal seed development and the percentage of filled seed. This method is considered a continual monitoring technique.

CAS is a relatively high cost method of measuring specific clonal or single tree traits. It provides a radiographic analysis of the seed, a measure of seed production capacity, seed production efficiency, viability of the extracted seed, first and second year seed abortion and the variability of each character. This method is considered a temporary monitoring technique to provide reference material or in-depth evaluation.

To take advantage of the unique features of each of these programs requires a scheme to integrate them. One possible scheme would be to analyze every clone by SOSET as a first step. This would determine the amount and quality of the seed each clone contributes to total orchard production. A general picture of production is, therefore, obtained quickly and at reasonable cost. Then CAS would be applied, beginning with the best and poorest clones, until all clones have been analyzed. The CAS will provide a detailed data base on the orchard's potential seed production and on the possible causes for lost production. This data base will be of value in understanding differences among clones and in making management decisions. Several years would be required to complete CAS on all clones because of time and cost restraints.

There is also a need for continual monitoring with SOSET to detect any changes in production resulting from alterations in management practices, fluctuations in insect populations, or similar factors. This type of monitoring may be accomplised by using the same clones annually. The samples should include several better and several poorer clones so that the full range of seed production is considered. It would begin soon after the initial broad evaluation and be continued for the life of the orchard. Those clones not sampled annually should be tested on some rotating schedule to assure that no problems go undetected.

The exact scheme for long and short term evaluation will depend on the particular objectives and problems at each orchard. Consultation with seed laboratory personnel is always available in developing an appropriate program.

ADDRESSES OF SEED ORCHARDS

PROVIDING FURADAN® APPLICATION INFORMATION

1. Seed Orchard
Boise Southern
P. O. Box 1000
DeRidder, LA 70634

2. Seed Orchard
Brunswick Pulp Land Co.
Box 860
Brunswick, GA 31520

3. Seed Orchard
Buckeye Cellulose Corp
Perry, FL 32347

4. Seed Orchard
Catawba Timber Co.
Box 128
Rock Hill, SC 29730

5. Seed Orchard
Chesapeake Corp.
West Point, VA

6. Seed Orchard
Container Corp. of America
P. O. Box 626
Callahan, FL 32011

7. Seed Orchard
Continental Forest Ind.
Box 160
Hodge, LA 71247

8. Seed Orchard
Continental Group, Inc.
P. O. Box 263
Statesboro, GA 30458

9. Erambert Federal Seed Orchard
U.S. Forest Service
RR Box 150
Brooklyn, MS 39425

10. Seed Orchard
Federal Paper Board Co., Inc.
P. O. Box 1001
Lumberton, NC 28358

11. Seed Orchard
Florida Division of Forestry
2755 US 51 N.
Brooksville, FL 33512

12. Seed Orchard
Georgia Forestry Commission
P. O. Box 819
Macon, GA 31201

13. Seed Orchard
Georgia Kraft Company
Genetics Div. Section
P. O. Box 296
Greensboro, GA 30642

14. Seed Orchard
Gilman Paper Company
P. O. Box 548
Day, FL 32013

15. Seed Orchard
Hiwassee Land Company
Calhoun, TN 37309

16. Seed Orchard
International Paper Co.
P.O. Box 2328
Mobile, AL 36601

17. Seed Orchard
ITT Rayonier
Glennville, GA 30427

18. ITT Rayonier
Waterman Orchard
Yulee, FL 32097

19. MacMillan Blodel, Inc.
Pine Hill, AL 36769

20. Seed Orchard
Miss. Forestry Commission
908 Robert E. Lee Bldg.
Jackson, MS 39201

21. Seed Orchard
North Carolina Forest Service
Route 8 Box 380
Goldsboro, NC 27530

22. Seed Orchard
OK State University Forest
Genetics Res. Station
RFD#1 Box 63
Idabel, OK 74745

23. Seed Orchard
OI-Southern Woodlands
Drawer A
White Spring, FL 32096

24. Seed Orchard
Scott Paper Co. - Woods Div.
Box 2447
Mobile, AL 36601

25. Seed Orchard
Tenn. River P & P Co.
Box 33
Counce, TN 38326

26. Seed Orchard
Union Camp Corp.
P. O. Box 216
Rincon, GA 31326

27. Seed Orchard
Weyerhaeuser Company
Route 3 Box 282
Washington, NC 27889

28. Seed Orchard Manager
Weyerhaeuser Co.
Craig Orchard
Broken Bow, OK 74728

29. Seed Orchard
Weyerhaeuser Co.
Rt 1 Box 95B
Eutaw, AL 35462

30. Seed Orchard
Weyerhaeuser Company
Rt 5 Box 164A
Magnolia, AR 71753

31. Seed Orchard
NC Forest Service
Route 2 Box 942
Elizabethtown, NC 28337

WHERE TO GET ASSISTANCE

STATE PEST MANAGEMENT SPECIALISTS - 13-State Area of SA

State Cooperator and Address	I&D Specialist	Phone Number
Alabama Forestry Comm. 513 Madison Avenue Montgomery, AL 36104	James R. Hyland	205-832-5897
Arkansas Forestry Comm. 3821 W. Roosevelt Road Little Rock, AR 72204	James L. Northrum	501-371-1736
Florida Division of Forestry Collins Building Tallahassee, FL 32304	Charles W. Chellman	904-488-7936
Georgia Forestry Comm. P. O. Box 819 Macon, GA 31202	John Godbee	404-744-3241
Kentucky Division of Forestry 207 Holmes St. Frankfort, KY 40601	Mark Matezewski	502-564-4496
Louisiana Forestry Comm. P. O. Box 1628 Baton Rouge, LA 70721	Gus Nachod	504-389-7121
Mississippi Forestry Comm. 908 Robert E. Lee Bldg. Jackson, MS 39201	Richard J. Collins Joe Cook	601-354-7124
North Carolina Dept. of Natural Resources P.O. Box 27687 Raleigh, N.C. 27611	Coleman A. Doggett	919-733-4141
Oklahoma Forestry Div. State Board of Agriculture Capitol Bldg. Oklahoma City, OK 73105	Jim Stanford	405-521-3886
South Carolina State Comm. of Forestry P. O. Box 21707 Columbia, NC 29202	John E. Graham	803-758-2261

State Cooperator and Address	I&D Specialist	Phone Number
Tennessee Division of Forestry 2611 West End Avenue Nashville, TN 37203	Bruce Kauffman	615-741-3326
Texas Forest Service P. O. Box 310 Lufkin, TX 75901	Ronald F. Billings Scott Cameron	713-632-7761
Virginia Division of Forestry P. O. Box 3758 Charlottesville, VA 22903	*Caleb Morris* Jim Capony	804-977-6555

U. S. FOREST SERVICE, STATE & PRIVATE, FI&DM & EQE ENTOMOLOGISTS, PATHOLOGISTS, AND SPECIALISTS

Area Office and Address -
Forest Service
Southeastern Area
State & Private Forestry
1720 Peachtree Rd., NW
Atlanta, GA 30309

Comm. 404-881-2961 (FI&DM)
Comm. 404-881-3734 (EQE)

Harvey V. Toko	FI&DM Staff Director
Kenneth M. Swain	Staff Entomologist
Vacant	Staff Pathologist
William H. Padgett	EQE Staff Director
Bill L. Stevenson	Pesticide Specialist
William H. Clerke	Survey Improvement Specialist
Vacant	Biometrician
J. W. Lewis	*Entomologist*

Asheville Field Office
Forest Insect & Disease Management
State & Private Forestry
P. O. Box 5895
Asheville, NC 28803

Comm. 704-258-2850, Ext.62

Harold Flake	Field Representative
C. E. Cordell	Pathologist (Nursery Specialist)
W. H. Sites	Pathologist
Susan D. Hubbard	*Pathologist*
P. J. Barry	Entomologist

Iral R. Ragenovich	Entomologist
John Ghent	Entomologist
L. Barber	Entomologist (Seed Orchards)

Alexandria Field Office
Forest Insect & Disease Management
State & Private Forestry
2500 Shreveport Highway
Pineville, LA 71360

Comm. 318-445-6511, Ext.31

Robert C. Loomis	Field Representative
Gerard D. Hertel	Entomologist - (Pilot Projects, Seed Orchard Coordination)
Neil A. Overgaard	Entomologist (Seed Orchards)
Charles E. Affeltranger	Pathologist (Nursery Problems)
Phyllis A. Dugar	Pathologist
Terrence J. Rogers	Entomologist
James D. Smith	Entomologist (Nursery Insects)
Catherine R. Stein	Entomologist (Hardwood Insects)
Daniel B. Twardus	Entomologist

Doraville Field Office
Aerial Survey Team
U. S. Forest Service
3620 Interstate 85, NE
Doraville, GA 30340

Comm. 404-526-5796 or
404-455-7705

J. D. Ward	Survey Team Leader
C. Dull	Entomologist
Paul A. Mistretta	Pathologist
Bill Carothers	Entomologist